

WATER QUALITY CONDITIONS

While some of Fairfax County's water resources exhibit characteristics that are supportive of high quality ecological systems, most bodies of water in the County have experienced degradation as land use changes within their watersheds have resulted in increased impervious cover, with the resulting changes in hydrologic conditions as described earlier in this report. In addition, high fecal coliform bacteria concentrations have been measured in streams throughout the County. Several ongoing efforts have documented various aspects of water quality conditions in the County. This section of this report highlights key findings from several of these efforts.

ANNUAL STREAM WATER QUALITY REPORT

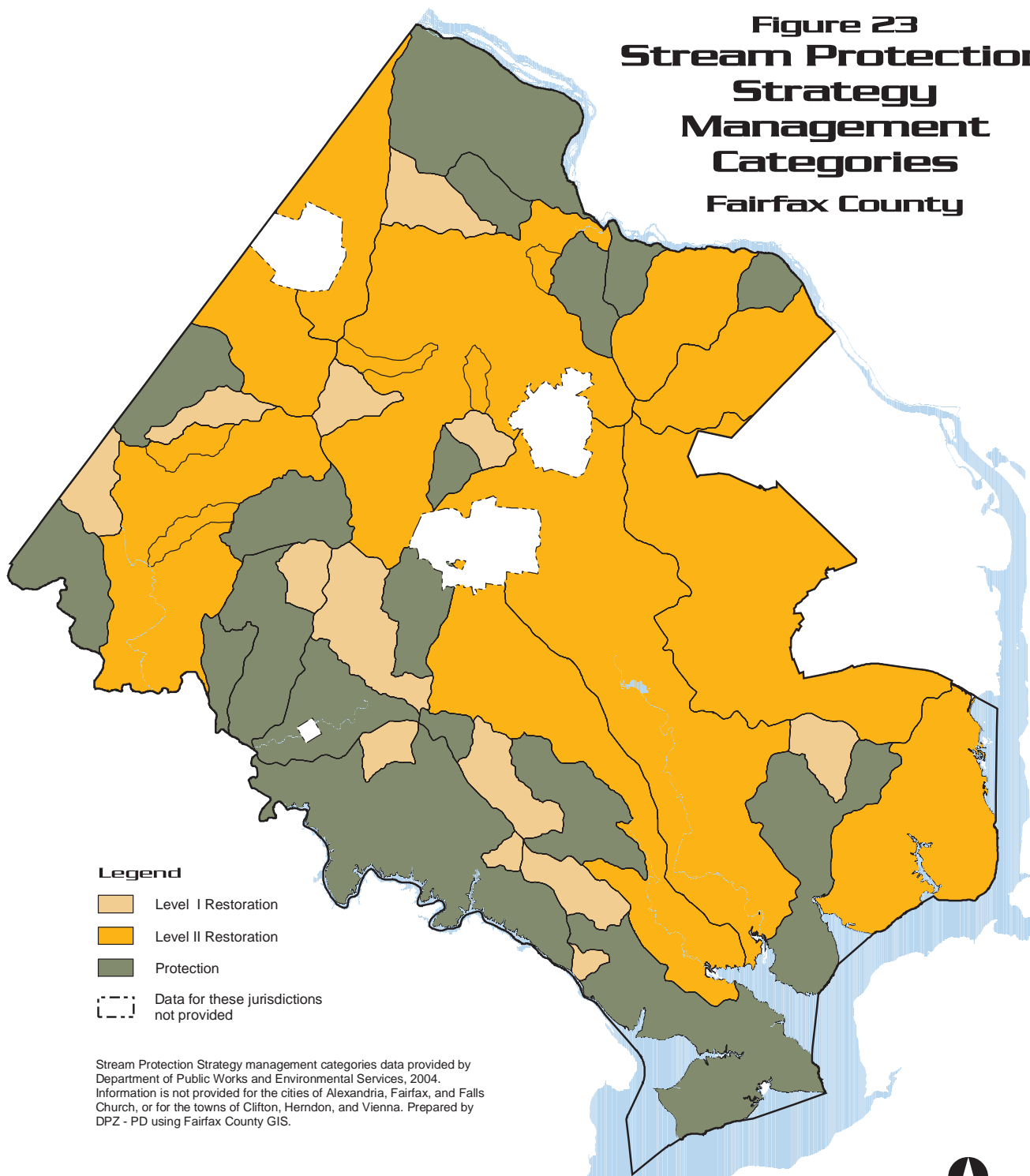
The Stream Water Quality Report has been produced on an annual basis by the Fairfax County Health Department; responsibility for production of this report is now being assumed by the Department of Public Works and Environmental Services. The report presents chemical, temperature, and fecal coliform bacteria data obtained from stream sampling sites located throughout the County. The 2002 report includes data collected from 84 sampling sites taken from 25 of the County's 30 watersheds. Monitoring parameters include fecal coliform bacteria, total phosphorus, nitrate nitrogen, dissolved oxygen, pH, and temperature. In addition, the 2002 report presents data associated with ten years of testing for eight heavy metals as well as results of analysis of grab samples taken from Lake Accotink and a sampling effort in the Accotink Watershed within Fairfax City.

The data do not indicate significant trends in average stream temperature or in chemical parameter concentrations in the 17 year period identified in the 2002 report (the report includes data from 1986-2002). Further, almost all samples collected met chemical water quality standards (with 6% of the samples having dissolved oxygen concentrations below 4.0 mg/l, four samples exceeding 10 mg/l of nitrate nitrogen, four samples with pH values above 8.5, and 16 samples with pH values below 6.0 (with follow-up testing indicating normal pH at these sites). However, consistent with previous years' analyses, fecal coliform bacteria concentrations routinely exceeded Virginia's Water Quality Standards; only 17% of the samples had fewer than 200 fecal coliform bacteria per 100 ml of water (Virginia's geometric mean standard for two or more samples over a 30 day period), and 25% of the samples had more than 1,000 fecal coliform bacteria per 100 ml of water (Virginia's single-event standard). More discussion regarding fecal coliform bacteria issues is provided later.

STREAM PROTECTION STRATEGY

The Stream Protection Strategy (SPS) program was initiated in 1997 in order to provide a comprehensive assessment of the ecological health of the County's streams based on biological, physical, and chemical conditions. A comprehensive baseline survey was initiated in 1998 that included the monitoring of 114 stream segments Countywide; this study established the first survey of fish and benthic macroinvertebrate (aquatic insects) communities in the County. The results of this survey, which was published in January, 2001, were used to classify each of the

Figure 23
Stream Protection
Strategy
Management
Categories
Fairfax County



County's subwatersheds into management categories based on their biological conditions and projected land use changes. Three categories were established as follows:

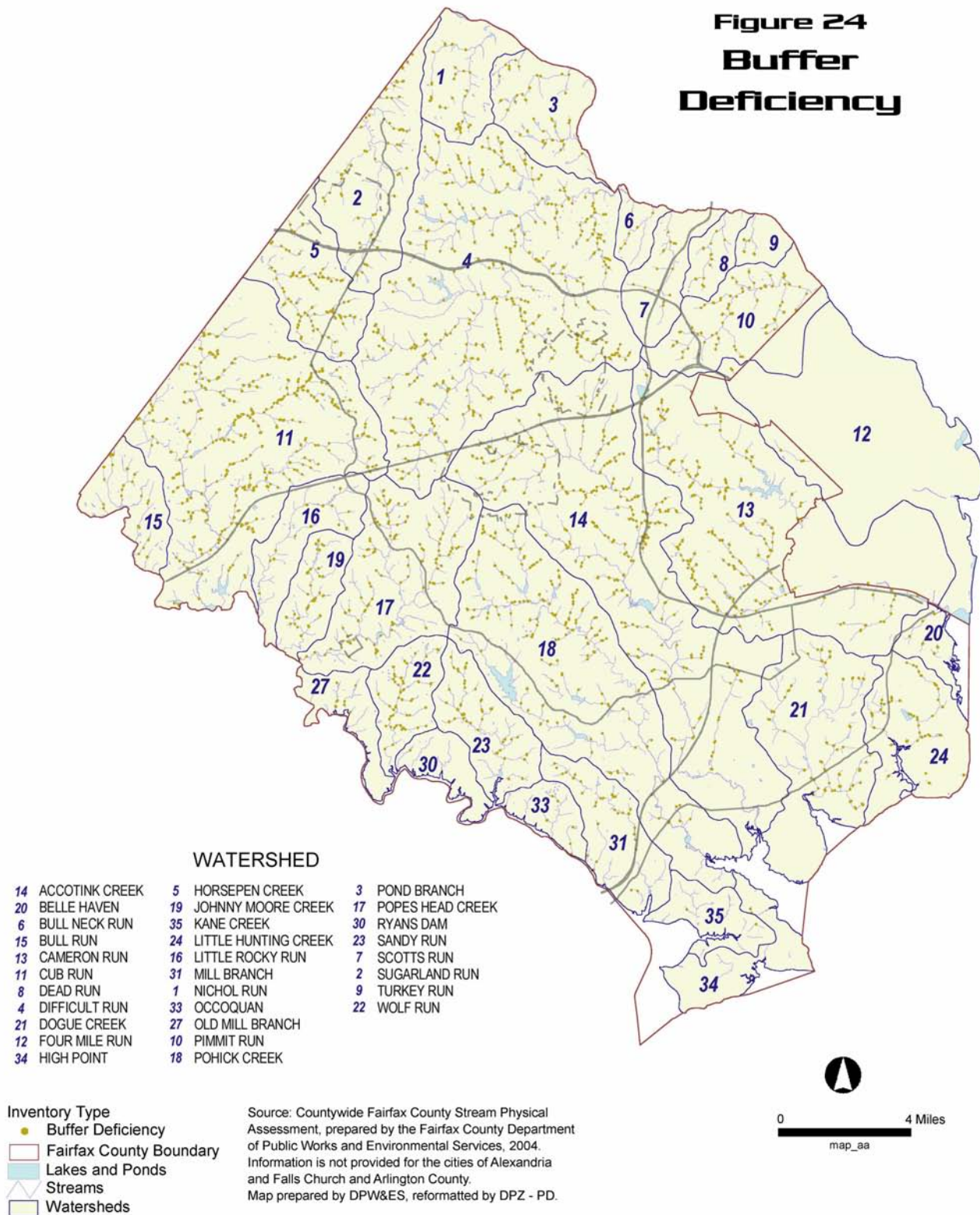
- **Watershed Protection:** This category has been assigned to subwatersheds with streams with biological communities that are relatively healthy. The primary goal in these areas is to "preserve biological integrity by taking measures to identify and protect, to the extent possible, the conditions responsible for current high quality rating of these streams."
- **Watershed Restoration Level I:** This category has been assigned to subwatersheds with streams that have fair biological conditions and that are in areas where substantial development activity is ongoing, but that still hold potential for significant stream quality enhancement. The primary goal in these areas is "to reestablish healthy biological communities, where feasible, by taking measures to identify and remedy the cause(s) of stream degradation both broad scale and site specific."
- **Watershed Restoration Level II:** This category has been assigned to subwatersheds characterized by relatively high development densities, significantly degraded instream habitat conditions, and significantly impacted biological communities. The primary goal in these areas is "to maintain areas to prevent further degradation and to take active measures to improve water quality to comply with Chesapeake Bay initiatives, Total Maximum Daily Load (TMDL) regulations and other water quality initiatives and standards."

Figure 23 displays the management categories assigned to subwatersheds in Fairfax County. There are some differences between the subwatershed-specific categories shown in Figure 23 and a similar figure that was presented in the January, 2001 publication. This is due to reclassifications that have been made by the Department of Public Works and Environmental Services subsequent to the publication of the report.

The SPS Baseline Study concluded that there is a statistically significant relationship between drainage area imperviousness and biological quality; the highest quality streams are located in areas that are largely undeveloped or developed in low densities, while the most degraded streams are located in areas that are most intensely developed. This relationship is evident in Figure 23; which generally identifies the lowest-impervious subwatersheds as being in the "Watershed Protection" category.

The SPS program has served as a springboard for more intensive stream assessment and watershed management efforts, which are described below and later in this report. The SPS program itself is ongoing, with a stratified random sampling procedure used to evaluate the state of the County's streams on an annual basis and the establishment of permanent sites to assess trends at selected locations. Data provided by volunteer water quality monitors from the Northern Virginia Soil and Water Conservation District and the Audubon Naturalist Society will be used to support trend analysis; these data, which are collected at each monitoring location several times per year, also provide information that can be used to identify and alert appropriate

Figure 24
Buffer
Deficiency



parties to problems such as rapidly degrading stream channels and illegal discharges. A fecal coliform monitoring component will be incorporated into the SPS program in the future. A Watershed Protection and Restoration strategies study is also being completed with the following goals:

- Establishment of management categorizations at the subwatershed scale based on predicted ultimate imperviousness;
- The identification of areas where the use of selected Low Impact Development (LID) techniques for promoting groundwater recharge is most feasible;
- The ranking and prioritization of subwatersheds for implementation of LID techniques and stormwater quality retrofits.

COUNTYWIDE STREAM PHYSICAL ASSESSMENT

An extensive set of baseline stream condition information has been collected throughout the County to support watershed protection and restoration efforts. This assessment was conducted on approximately 801 miles of streams, and results will be incorporated into the watershed planning process to assist in the determination of appropriate watershed management strategies. The assessments included an inventory of physical stream features and habitat assessments; inventory information such as stream obstructions, stream reaches experiencing erosion, insufficient riparian buffer areas, and dump sites along streams will be incorporated into the watershed management planning process. Maps displaying the following features are provided in Figures 24, 25, and 26:

- Buffer Deficiencies;
- Pipes, Ditches, Dumps, and Utilities; and
- Erosion and Obstructions.

IMPAIRED WATERS

As noted on the Web site of the Virginia Department of Environmental Quality (VDEQ), Section 303 (d) of the Clean Water Act requires states to identify waters that are not in compliance with water quality standards and to develop plans, known as "Total Maximum Daily Loads," or TMDLs, to restore and maintain the water quality for these impaired waters. The TMDL effort is designed to determine the total amounts of pollutants of concern that a particular body of water can receive and still achieve water quality standards. In Virginia, the 1997 Water Quality Monitoring, Information and Restoration Act requires that implementation plans be developed for every TMDL in the state in order to bring pollutant loads down to the levels identified by the TMDLs. Two TMDLs have been developed by the state and approved by the U.S. Environmental Protection Agency for bodies of water in or near Fairfax County: a 4.5 mile segment of Accotink Creek upstream of Lake Accotink; and Four Mile Run, which is located largely in Arlington County and the City of Alexandria but which collects drainage from portions of Fairfax County. An implementation plan has been developed for Four Mile Run, and an implementation plan is being developed for Accotink Creek.

**Figure 25
Pipes, Ditches,
Dumps, and
Utilities**

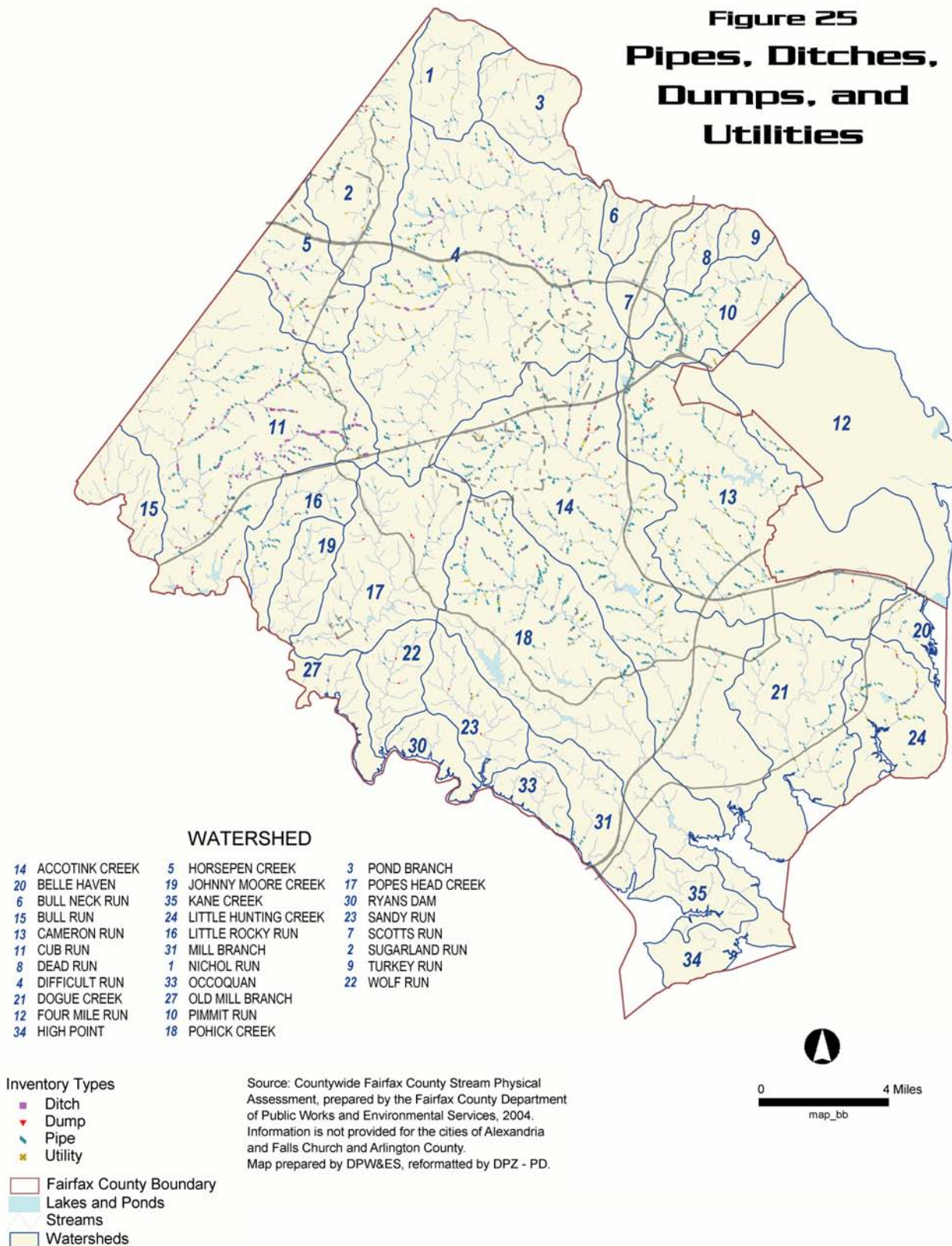
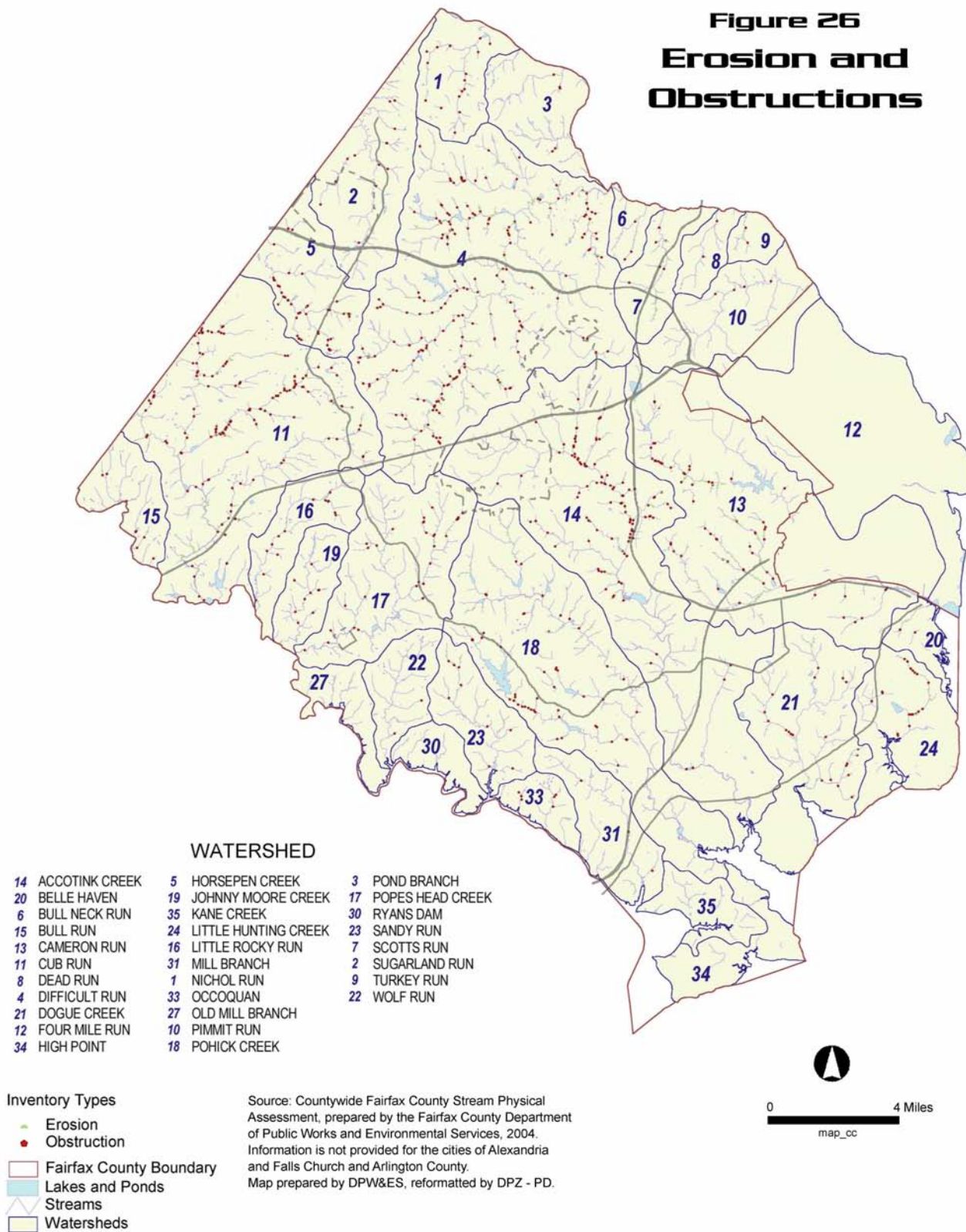


Figure 26
Erosion and
Obstructions



VDEQ updates its list of impaired waters in Virginia every two years. The 2002 list identified 17 bodies of water that are partially or entirely located in Fairfax County that are impaired (see Table 6). TMDLs and implementation plans will need to be prepared for each of these bodies of water. It is anticipated that TMDLs will be developed for these waters by 2014, with several TMDLs to be developed earlier (e.g., Popes Head Creek, Bull Run, Difficult Run, and another segment of Accotink Creek).

A draft of the 2004 Water Quality Assessment 305(b)/303(d) Integrated Report, dated March, 2004, identifies a number of changes to the list of impaired waters, including additional impaired waters designations as follows:

1. Holmes Run downstream of Lake Barcroft (fecal coliform);
2. Holmes Run upstream of Lake Barcroft (general standard—benthic);
3. Tripps Run upstream of Lake Barcroft (general standard—benthic).

This report also identifies additional impairments for bodies of water that had already been identified as being impaired, as follows:

1. Difficult Run downstream of Captain Hickory Run (fecal coliform and e Coli);
2. The tidal portion of Little Hunting Creek (fecal coliform);
3. The nontidal portion of Accotink Creek downstream of Calamo Branch (fecal coliform);
4. Other portions of Accotink Creek upstream of Lake Accotink (e Coli)
5. A segment of Bull Run between Cub Run and roughly one mile downstream of Popes Head Creek (fecal coliform)
6. The Occoquan River near the Route 123 bridge (fecal coliform)

As part of the development of TMDLs for Accotink Creek and Four Mile Run, studies were undertaken to determine the sources of the fecal coliform bacteria that are present in each stream. For Accotink Creek, the United States Geological Survey (USGS), in partnership with the Virginia Department of Conservation and Recreation (DCR), VDEQ, the City of Fairfax, and Fairfax County, conducted DNA tests to “fingerprint” the species associated with the fecal coliform bacteria extracted from stream water samples. The initial study results indicated that sources of bacteria from identifiable samples were distributed as follows: 40% waterfowl; 20% human; 13% dogs; 5.4% raccoons; 1.4% deer; and 21% other. A draft TMDL for Accotink Creek that has been developed by VDEQ and approved by the U.S. Environmental Protection Agency (EPA) includes a goal to reduce the human sources of fecal coliform bacteria by 99%. As a follow-up to the TMDL, the USGS has initiated another study, in cooperation with Fairfax County, the City of Fairfax, and DCR, to identify and track specific sources of discharges of human fecal coliform bacteria into the Accotink Creek watershed. It is anticipated that this study will lead to the development of a cost-effective implementation plan for the watershed to address TMDL requirements.

For Four Mile Run, the Northern Virginia Regional Commission (NVRC), in partnership with the Virginia Polytechnic Institute, conducted a DNA “fingerprinting” analysis of the sources of fecal coliform bacteria in streams in that watershed. The results of this analysis, as presented in the TMDL report that was submitted to and accepted by VDEQ (and subsequently approved by

TABLE 6 Impaired Waters in Fairfax County: The Virginia Department of Environmental Quality's 2002 List		
Name	County	Impairment
<u>Sugarland Run</u>	Fairfax, Loudoun	Fecal Coliform
<u>Difficult Run</u>	Fairfax	General Standard (Benthic)
<u>Pimmit Run</u>	Fairfax, Arlington	Fecal Coliform
<u>VA Tidal Waters from Woodrow Wilson Bridge to Brent Point</u>	Fairfax, Prince William, Stafford	Fish Tissue - PCBs
<u>Hunting Creek/Cameron Run</u>	Fairfax, Alexandria, City of	Ammonia, Fecal Coliform, Fish Tissue - PCBs
<u>Backlick Run</u>	Fairfax, Alexandria, City of	Fecal Coliform
<u>Little Hunting Creek</u>	Fairfax	Fish Tissue - PCBs
<u>Pohick Bay</u>	Fairfax	Ammonia, Fish Tissue - PCBs
<u>Accotink Creek</u>	Fairfax, Fairfax City of	Fecal Coliform
<u>Accotink Creek</u> *	Fairfax	Fecal Coliform
<u>Accotink Creek</u>	Fairfax	General Standard (Benthic)
<u>Pohick Creek</u>	Fairfax	Fecal Coliform, Fish Tissue - PCBs, PAH
<u>Popes Head Creek</u>	Fairfax	General Standard (Benthic)
<u>Bull Run</u>	Prince William, Fairfax	General Standard (Benthic)
<u>Occoquan Reservoir</u>	Fairfax, Prince William	Dissolved Oxygen, Total Phosphorus
<u>Occoquan Bay</u>	Fairfax, Prince William	pH, Fish Tissue - PCBs
<u>Mills Branch</u>	Fairfax	Fecal Coliform

Source: Virginia Department of Environmental Quality Web site.

Note: Four Mile Run is not listed on the Web site addressing TMDLs in Fairfax County, although a small portion of the watershed of Four Mile Run is located within the County. A TMDL Study for Four Mile Run has already been developed.

*A TMDL Study for this stream segment has already been developed.

EPA), indicated that sources of bacteria from identifiable samples were as follows: 31.8% waterfowl; 18.9% raccoons; 17.9% human; 12.9% canine; 5.6% deer; and 12.9% other. Of particular note in the Four Mile Run study was a suggestion that fecal coliform bacteria in storm drains appear to regrow, thereby perpetuating high fecal coliform bacteria concentrations. The TMDL allocations determined for Four Mile Run require reductions in current levels of fecal coliform bacteria from human and canine sources of 98%. It is anticipated that a ten-year strategy will be pursued to reduce fecal coliform bacterial levels in Four Mile Run that will focus on a broad range of actions, including outreach and education efforts.

The TMDL requirement to address the dissolved oxygen impairment in the Occoquan Reservoir is of particular note, in that the VDEQ "Impaired Waters Fact Sheet" indicates that the Reservoir "fully supports the public water supply use, and is not impaired as a drinking water source." However, the Reservoir is considered to be impaired because of low dissolved oxygen concentrations in the waters at the bottom of the reservoir (especially near the toe of the dam embankment); dissolved oxygen concentrations in these waters are typically below 4.0 mg/l. The VDEQ fact sheet recognizes that "bottom dissolved oxygen depletion occurs naturally in reservoirs due to stratification." Yet, a TMDL study identifying a strategy to remove the impairment must still be developed by VDEQ by 2010. In light of actions that have already been taken to reduce nutrient inputs into the Reservoir (e.g., stringent point source discharge limitations; nonpoint source best management practice requirements), this will be a particular challenge that has the potential to impact land use policies throughout the watershed of the Reservoir. At this time, the Northern Virginia Regional Commission and Occoquan Watershed Monitoring Laboratory are discussing the development of the TMDL study with VDEQ.

Another, broader, TMDL effort that is of particular note is that addressing the entirety of the Chesapeake Bay system. As noted on the Chesapeake Bay Program's Web site (www.chesapeakebay.net/info/wqcriteriatech/index.cfm), "most of the mainstem Chesapeake Bay and many of its tidal tributaries have been listed as impaired waters," and "a regulatory TMDL covering the entire 64,000 square mile Bay watershed will be put in place by 2011 if Bay water quality is not restored by 2010." Clearly, this lends considerable urgency to current cooperative, voluntary efforts to restore the health of the Chesapeake Bay and its tributaries. The current focus of this effort is the development of strategies to restore to the Bay and its tributaries those water quality conditions that are needed to support the living resources that inhabit these waters. "Tributary strategies" are being developed by each Bay Program jurisdiction in each of the Bay's major watersheds to identify the maximum pollutant loads that can be accommodated by each tributary consistent with the goal of restoring living resource habitats and to achieve reductions in pollutant loadings to attain these maximum pollutant loads. Once these targets are attained, they must be maintained (that is, increases in pollutant loadings resulting from continued growth and development must be offset). Efforts to develop a "Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the Shenandoah and Potomac River Basins" in Virginia are under way. While the Tributary Strategy and TMDL efforts fall beyond the scope of this Comprehensive Plan Supplement, the significance of this effort to Fairfax County should be recognized; indeed, it is possible, if not likely, that expensive nutrient and sediment reduction efforts, such as upgrades to sewage treatment plants, contributions to upgrades of plants to which the County contributes, and nonpoint source best

management practice retrofit projects, will need to be pursued. Growth and development policies and practices in the County and region could also be affected. Information regarding the State's Tributary Strategy effort can be found at the following Web site: <http://www.naturalresources.virginia.gov/Initiatives/TributaryStrategies/index.cfm>. ■